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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,319	02/09/2005	Farid N. Najm	361007-000043	6437
24239	7590	10/25/2006	EXAMINER	
MOORE & VAN ALLEN PLLC			KING, DOUGLAS	
P.O. BOX 13706			ART UNIT	
Research Triangle Park, NC 27709			PAPER NUMBER	
			2824	

DATE MAILED: 10/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/524,319

Applicant(s)

NAJM ET AL.

Examiner

Douglas King

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on 20 September 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-5 and 9-13 is/are allowed.
- 6) ☒ Claim(s) 1,2,6-8 and 14-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 September 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
- Paper No(s)/Mail Date \_\_\_\_\_

- 4) ☒ Interview Summary (PTO-413)
- Paper No(s)/Mail Date. 9/19/06
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Amendment***

Acknowledgment is made of applicant's Amendment, filed 20 September 2006.

The changes and remarks therein have been considered.

Claims 14-17 have been added by amendment. Therefore, claims 1-17 are pending in the application.

Regarding the interview with applicant's representative Greg Stevens on 14 June 2006, and subsequently on 19 September 2006, Mr. Stevens initially contacted the examiner pointing out the omission of claims 14-17. Since claims 14-17 were present in the PCT application of which the instant application is in National Stage, the examiner requested an amendment to allow the office to correctly bill applicant for the correct number of claims. The amendment filed 5 September 2006 did not include the full listing of claims and was not entered by office staff. Therefore, a subsequent request for the amendment filed 20 September was made. The action below includes all material presented in the action mailed 5 June 2006 with the addition of examination on the merits of claims 14-17.

### ***Oath/Declaration***

The specification to which the oath or declaration is directed has not been adequately identified. See MPEP § 602.

The oath should be directed to the PCT Application Number via the second check box on the Declaration form.

### ***Information Disclosure Statement***

1. Acknowledgment is made of applicant's Information Disclosure Statement (IDS) Form PTO-1449, filed 9 February 2005. The information disclosed therein was considered.

### ***Drawings***

2. Figures 1 and 13 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to because the operation of the sense amplifier of Figure 14 in view of the specification (pages 16-17) is unclear. It appears that the output nodes A and B should be conductively connected to nodes between transistors P1, N1 and P2, N2 respectively. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must

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be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

4. Claims 3, 9, and the claims which depend therefrom (4,5,10-13) are objected to because of the following informalities. In claim 3 lines 27-34 refer to "a first pair of cross coupled inverters across a bitline (BL) and a bitline bar (BLB)" and later to a "second pair of cross couple inverters." According to the embodiment of figure 14 (see objection above) and to the specification regarding the sense amplifier it is unclear as to whether the described devices function as inverters. Appropriate correction is required.

### **5. *Claim Rejections - 35 USC § 102***

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 1, 2, 6, 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Yamauchi (USPGPUB 2003/0002328).**

**Regarding independent claim 1,** Yamauchi discloses an asymmetric SRAM cell (see paragraph 8) for storing a binary variable, the asymmetric SRAM cell having reduced leakage power with respect to a comparable symmetric SRAM cell (see paragraphs 28 and 36) when the asymmetric SRAM cell stores a binary variable representing a predetermined binary value (a "low" value, for example), the asymmetric SRAM cell comprising: a plurality of transistors (Figure 1, elements MN0-MN3, MP0, and MP1) operably coupled and configured as an asymmetric SRAM cell (see paragraph 8), wherein the plurality of transistors include at least one first type of transistor (Figures 1 and 2, transistor MN1) and at least one second type of transistor (Figures 1 and 2, transistor MN0) that is weaker than the first type of transistor (Figure 2, second transistor MN0 has higher threshold voltage and smaller gate (channel) width than first transistor MN1), such that the configuration of the asymmetric SRAM cell achieves reduced leakage power with respect to a symmetric SRAM cell having the first type of transistor only (see paragraphs 28 and 36).

**Regarding dependent claim 2,** Yamauchi discloses the asymmetric SRAM cell of claim 1 wherein at least one of the second type of transistor is a transistor having a higher voltage threshold as compared to the voltage threshold of the first type of transistor (see Figures 2 and 3, where MN1 is the first type and MN0 is the second type). Yamauchi further discloses the asymmetric SRAM cell of claim 1 wherein at least one of the second type of transistor is a transistor having a decreased channel width as compared to the channel width of the first type of transistor (see Figures 2 and 3, gate width).

**Regarding independent claim 6,** Yamauchi discloses an SRAM device comprising an array of SRAM cells (in paragraph 1 “memory cells can be arranged” implies a plurality of arranged memory cells) wherein each SRAM cell stores a binary variable representing a predetermined binary value (a “low” value for example) , and each SRAM cell is an asymmetric SRAM cell having reduced leakage power with respect to a comparable symmetric SRAM cell (see paragraphs 28 and 36 in view of the plurality of cells described in paragraph 1) each asymmetric SRAM cell comprising: a plurality of transistors (Figure 1, elements MN0-MN3, MP0, and MP1) operably coupled and configured as an asymmetric SRAM cell (see paragraph 8), wherein the plurality of transistors include at least one of a first type of transistor (Figures 1 and 2, transistor MN1) and at least one second type of transistor (Figures 1 and 2, transistor MN0) that is weaker than the first type of transistor (Figure 2, second transistor MN0 has higher threshold voltage and smaller gate (channel) width than first transistor MN1), such that the configuration of the asymmetric SRAM cell achieves reduced leakage power with respect to a symmetric SRAM cell having the first type of transistor only (see paragraphs 28 and 36).

**Regarding independent claim 14,** Yamauchi discloses (see Figure 1) an asymmetric static random access memory cell operable with a supply voltage to store a one or a zero, the asymmetric SRAM cell further comprising: at least two cross-couple inverters (MP1+MN1, MP0+MN0) connected to a bitline bar when a wordline is held high (connected to RBL when WLR is high) and the other having an output electrically connected to a bit line when a word line is held high and the other having an output

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electrically connected to a bit line when a word line is held high (connected to WBL when WLWT is high) and further comprising a pull-down transistor (MNO or MN1); a pass transistor (MN3) connected to a gate of the pull-down transistor (MN0) so that a voltage across the gate is reduced relative to the supply voltage, thereby reducing leakage through the gate when the asymmetric SRAM cell is storing a zero (see paragraph 0028).

**Regarding dependent claim 15**, Yamauchi discloses the asymmetric SRAM cell of claim 14 wherein a voltage at a gate of the pass transistor is reduced relative to the supply voltage to further reduce leakage through the gate of the pull-down transistor (see paragraph 0028)

**Regarding dependent claim 16**, Yamauchi discloses the asymmetric SRAM cell of claim 14, wherein the first and second inverters comprise a plurality of transistors further comprising at least one first type of transistor (Figures 1 and 2, transistor MN1) and at least one second type of transistor (Figures 1 and 2, transistor MN0) that is weaker than the first type of transistor (Figure 2, second transistor MN0 has higher threshold voltage and smaller gate (channel) width than first transistor MN1).

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



**8. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamauchi (USPGPUB 2003/0002328) in view of Meyer (US Patent No. 6,425,056).**

Regarding claims 7 and 8, Yamauchi discloses the SRAM device of claim 6 but does not explicitly disclose that the asymmetric SRAM cell device comprise an SRAM device selected from the group consisting of a direct store SRAM device or a selectively inverted SRAM device as in claim 7. Further, Yamauchi does not disclose that the SRAM device comprises a cache memory selected from the group consisting of a direct store cache memory and a selectively inverted cache memory as in claim 8. However, Meyer teaches the direct store (called direct mapped by Meyer) cache memory may include any of a wide-variety of suitable high-speed memory devices, particularly SRAM memory (Meyer, column 4 lines 7-12, and column 2 lines 49-51). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the asymmetric SRAM array of Yamauchi in the direct store cache as taught by Meyer, for the benefit of reducing current leakage (see Yamauchi paragraphs 8 and 28).

**9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamauchi (USPGPUB 2003/0002328) in view of Greenberg (US Patent No. 10524319).**

Regarding dependent claim 17, Yamauchi discloses the asymmetric SRAM cell of claim 16 but does not disclose the connection to a plurality of like cells and a sense amplifier further comprising pairs of cross-coupled inverters and a plurality of sense-amplifier transistor forming a dummy column of cells. However, the connections to

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pluralities of similar cells, the use of dummy or redundant columns, and the connection to sense amplifiers is common and well known in the art. For example, Greenberg discloses a memory with cross-coupled inverter type sense amplifier and dummy memory cells connected therewith (see Figures 1, 2, and 6). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to connect the memory cells of Yamauchi to like memory cells and construct a dummy column of memory cells with a sense amplifier because such an implementation is common and well known in the art.

***Allowable Subject Matter***

**10. Claims 3-5 and 9-13 would be allowable if rewritten to overcome the objections stated in above paragraph 4.**

**Regarding independent claim 3**, the following is an examiner's statement of reasons for allowance: there is no teaching or suggestion in the prior art of a sense amplifier for coupling with an asymmetric SRAM for providing faster access times comprised of: two pairs of cross-coupled inverters; a dummy column of cells storing a predetermined binary value at all times wherein during a read operation, said dummy column is operably coupled with the first pair of cross-coupled inverters; four input lines, a bitline (BL) and a bitline bar (BLB) input from the asymmetric SRAM cell and a dummy bitline (D) and dummy bitline bar input from the dummy column, wherein the dummy

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bitline is input to the sense amplifier on the same side as the bitline bar and the dummy bitline bar is input to the sense amplifier on the same side as the bitline.

**Regarding independent claim 9**, the following is an examiner's statement of reasons for allowance: there is no teaching of suggestion in the prior art of a combination asymmetric SRAM device and sense amplifier for coupling with said SRAM device for wherein at least one sense amplifier is comprised of: two pairs of cross-coupled inverters; a dummy column of cells storing a predetermined binary value at all times wherein during a read operation, said dummy column being operably coupled with the first pair of cross-coupled inverters; four input lines, a bitline (BL) and a bitline bar (BLB) from the asymmetric SRAM cell and a dummy bitline (D) and dummy bitline bar from the dummy column, wherein the dummy bitline is input to the sense amplifier on the same side as the bitline bar and the dummy bitline bar is input to the sense amplifier on the same side as the bitline.

As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Naffziger et al., U.S. PG PUB 2001/0043486; Yokozeki, U.S. Patent No. 6,556,472; Zhang et al., U.S. Patent No. 5,949,256.

Naffziger teaches a SRAM cell wherein the transistors are asymmetric in size.

Yokozeki teaches the use of dummy cells for the timing of memory read operations.

Zhang teaches an asymmetric sense amplifier.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas King whose telephone number is (571) 272-2311. The examiner can normally be reached on Monday-Friday 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSK

*Anh Phung* 10/20/06

**ANH PHUNG**  
**PRIMARY EXAMINER**